REMARKS/ARGUMENTS

Claims 1, 4-8, 11-15, and 22-24 are pending in the Application. Claims 1 and 5 are currently amended to delete the term "a solid," and replace it with an in line one of each claim, as proposed in our non-entered Amendment After Final Rejection filed March 19, 2010.

No new matter is added.

Rejections of Claims 1 and 4-6 under 35 U.S.C. § 112, 1st ¶

Previously presented Claims 1 and 4-6 were finally rejected under 35 U.S.C. § 112, 1st ¶, because the Examiner finds no written description, express or implied, for "a solid . . . magnetic coating film" as presented in previously presented Claims 1 and 5 in the Specification as originally filed. Office Action filed December 30, 2009, pages 2-3, ¶¶ 2-3. Because the term "a solid," in line 1 of Claims 1 and 5 is unnecessary, it is now deleted from both claims and replaced with the word an. Accordingly, the rejections should be withdrawn.

Rejections of Claims 1 and 4 under 35 U.S.C. § 102 over Hosoe

Previously presented Claims 1 and 4 were finally rejected under 35 U.S.C. § 102(b) as anticipated by Hosoe (US 2003/0094076, published May 22, 2003)(OA, pp. 3-4, ¶). The rejection is clearly erroneous and should be withdrawn.

A finding of anticipation is proper only if a single prior art reference describes every element of the claimed invention. *Hybritech Inc. v. Monoclonal Antibodies, Inc.*, 802 F.2d 1367, 1379 (Fed. Cir. 1986). When the subject matter the prior art discloses and the subject matter claimed differ, there is no anticipation. *Titanium Metals Corp. v. Banner*, 778 F.2d 775, 780 (Fed. Cir. 1985). However, the description of the elements need not be explicit. A finding of anticipation may be based on an inherent or implicit disclosure. *Standard Havens Products, Inc. v. Gencor Industries, Inc.*, 953 F.2d 1360, 1369 (Fed. Cir. 1991). Even so, *In re Oelrich*, 666 F.2d 578, 581 (CCPA 1981), teaches, "Inherency may not be established by

probabilities or possibilities." The fact that a certain element may be present in the prior art is not sufficient to establish the inherency of that characteristic. *In re Rijckaert*, 9 F.3d 1531, 1534 (Fed. Cir. 1993). "To establish inherency, the extrinsic evidence must make clear that the missing descriptive matter is necessarily present in the thing described in the reference, and that it would be so recognized by persons of ordinary skill." *In re Robertson*, 169 F.3d 743, 745 (Fed. Cir. 1999). Thus, to the extent the Examiner's rejection of Applicant's claims under 35 U.S.C. § 102 is based on a finding that Hosoe inherently describes the resin coated metal sheet Applicant claims, the rejection is improper and should be withdrawn.

On the other hand, if the evidence shows that persons having ordinary skill in the art reasonably would have understood from the prior art that all the elements of Applicant's claimed invention are necessarily described by Hosoe, then the burden shifts to Applicant to show otherwise. *In re Best*, 562 F.2d 1252, 1255 (CCPA 1977).

In this case, the Examiner finds that Hosoe describes spray coating "the inner parts of the frames of notebook personal computers" with a dispersion of polyester having dispersed therein a Ni-Fe alloy magnetic powder, i.e., so-called permalloy [0005; 0029], to 30-50 wt% solids (Hosoe, Example 3 [0078-0079; 0084]), and/or a solution of a polyether-imide having dissolved therein a Ni-Fe alloy magnetic powder to 30 wt% solids (Hosoe, Example 4 [0060-0062; 0080-0084]), and drying the coating to a film thickness of 30 μm [0086]. The process is more generally described by Hosoe at [0042-0048].

Hosoe also describes thermoplastic molding compositions comprising a Ni-Fe alloy magnetic powder dispersed in a thermoplastic resin such as polyethylene (PE), polypropylene (PP), polystyrene (PS), thermoplastic styrene elastomers, etc. [0041]. In Hosoe's Example 2 [0071-0073], there is described a sheet-like form of 0.1 mm thickness which is formed by molding a Ni-Fe alloy magnetic powder dispersed in butyl rubber and winding it around an LCD video cable [0073; 0075-0076].

In the Advisory Action dated April 7, 2010 (AA), the Examiner cites Chen (US 2003/0223189, published December 4, 2003) for its disclosure of a notebook computer comprising a frame **212** (Figures 2b and 2d) which preferably is a "thermally insulative material, such as plastic" [0007], but "may be of stainless steel" for structural strength [0028-0029]. The Examiner states (OA, pp. 2-3, bridging ¶), "Chen . . . demonstrates that frames of notebook computers are indeed well known in the art to be made of metal."

The Examiner's finding that Hosoe anticipates Claims 1 and 4 is clearly erroneous for the following reasons.

A single prior art reference, which itself does not describe a specific element of the claimed invention either explicitly or implicitly, does not anticipate a claimed invention including that element. The fact that Chen would have taught persons having ordinary skill in the art that the frame of "a notebook computer comprising a frame" may be made of stainless steel [0028-0029] does not reasonably establish that the frame of Hosoe's notebook computer is necessarily made of stainless steel. In fact, Chen teaches that frames of notebook computers are preferably made of thermally insulative materials [0031], preferably a plastic [0007].

Furthermore, attached hereto is an internet publication entitled "Adhesives For Polyetherimide, Ultem/PEI adhesion to dissimilar materials for structural bonding," 2009 RELTEK LLC, pages 1-3 (http://www.reltekllc.com/adhesives-for-polyetherimide.html 4/28/2010). Ultem 1000 is described on page 1. At page 2 of "Ultem/PEI adhesion," 1st full ¶, the reference teaches that Ultem has been successfully employed for microwave transparent high strength structural components "by bonding them to steel . . . using" an adhesive. Normally, Ultem generally resists adhesion to dissimilar materials (Ultem/PEI adhesion, p. 2, 3rd full ¶). At page 2 of "Ultem/PEI adhesion," 4th full ¶, the reference teaches that "PEI can be structurally bonded to . . . other substrates . . . using . . . adhesives."

At page 2 of "Ultem/PEI adhesion," 6th full ¶, the reference teaches that PEI may be bonded to dissimilar materials such as metals using adhesives. At page 2 of "Ultem/PEI adhesion," 8th full ¶, the reference teaches that "light mechanical abrasion . . . etching . . . plasma treatments and ultraviolet irradiation of polymer surface, have been shown to improve adhesion of metal thin films to polyimide, measured by a peel test." At page 3 of "Ultem/PEI adhesion," 2nd full ¶, the reference teaches (emphasis added):

> Bonding **Ultem** to dissimilar materials is a particular problem due to it's high thermal expansion coefficient--six times that of steel (unfilled PEI). As a consequence the adhesive bond joint must be designed to accommodate the expansion/contraction differential between materials to avoid failure.

In the resin coating with fine Ni-Fe alloy powder dispersed therein described in Hosoe's Example 4 [0080-0082] wherein Hosoe "coated onto the inner parts of the frames of notebook personal computers" to the prescribed dried film thickness [0084], the resin employed was the PEI "Ultem 1000" [0080]. Nevertheless, Hosoe did not prime or pretreat the surfaces of the inner parts of the frames, did not mention applying an adhesive to bond dissimilar materials, and did not accomodate for the high thermal expansion coefficient and expansion/contraction differential between PEI and steel materials to avoid bonding failure between the PEI film and steel frame. Hosoe's failure to recognize any bonding problems between PEI and a metal frame reasonably would have suggested to persons having ordinary skill in the art that Hosoe coated both the PEI-based coating of its Example 4 [0080] and the polyester-based coating of its Example 3 [0078-0079] onto the inner parts of the plastic frames of the notebook personal computers [0084].

That bonding between dissimilar materials was not a problem Hosoe faced is further evident from its Example 2 [0071-0073], wherein a dispersion of Ni-Fe alloy powder in butyl rubber was processed by molding onto an LCD video cable [0073]. LCD video cable comprises metal cable covered with a resin. The sheet-like form with which Hosoe covered the LCD video cable was applied and bonded to the resin cover which conventionally covers

the metal cable [0074-0076]. Note that the electromagnetic radiation noise of conventional LCD video cable with and without Hosoe's magnetic coating film was measured. Again, Hosoe did not mention any bonding problems between dissimilar materials.

Finally, the stainless steel frame to which Chen refers is frame **212** [0029] which is shown in its Figures 2b and 2d. Covering a frame of the kind and shape Chen depicts with Hosoe's magnetic coating film would not significantly attenuate electromagnetic waves radiating from a notebook personal computer and most certainly would not do so to the extent Hosoe requires [0086].

In fact, the evidence strongly suggest that the frame of Hosoe's notebook computer to which its magnetic film coating was applied was made of plastic material and was intended to be made of plastic material. Hosoe does not describe or reasonably suggest attaching its magnetic coating film to an object made of metal. Moreover, Hosoe would not have provided persons having ordinary skill in the art with any motivation to do so. The Examiner's rejections should be withdrawn.

<u>Rejections of Cls. 5-8, 11-15 & 22-24 under § 103 over Watase, Nagano, Hosoe, and Nakao</u>

Claims 5-6 were rejected under 35 U.S.C. 103(a) over Watase (KR 2003-0010506, published February 5, 2003) in view of Nagano (U.S. Patent 5,455,116, issued October 3, 1995). Claims 7-8 were rejected under 35 U.S.C. 103(a) over Watase in view of Hosoe. Claims 11-15 were rejected under 35 U.S.C. 103(a) over Watase in view of Hosoe and Nakao (U.S. Patent 5,945,218, issued August 31, 1999). Claim 22 was rejected under 35 U.S.C. 103(a) over Watase in view of Nagano. Claims 23-24 were rejected under 35 U.S.C. 103(a) over Watase in view of Nagano and Nakao.

In the Advisory Action dated April 7, 2010 (AA), pages 3-4, the Examiner stated:

> Watase is directed to a coating for an electronic device; . . . Nagano is directed to an EM wave reflection-preventing material; . . . Hosoe is directed to alloy powders and products applying said powders such as electromagnetic shielding materials (abstract); and . . . Nakao is directed to the formation of a multilayer film for

> improved surface gloss, smoothness and chipping resistance . . . . Clearly, one of ordinary skill in the art with the intention of coating an electronic device in a manner, and for the reasons, disclosed by . . . Watase . . . would be apprised of the further requirements for providing a coating with properties of absorbing microwaves . . . and . . . demand a degree of gloss and smoothness for aesthetic appeal, and chipping resistance . . . .

The problems with the Examiner's broad statement that Applicant's claims would have been prima facie obvious over the state of the art are: (1) erroneously grouping all electronic devices together, (2) erroneously grouping all problems relating to electronic devices together, and (3) erroneously presuming that persons having ordinary skill in the art generally are motivated to solve problems associated with, and improve, all electronic devices in order to solve problems which appear to be specific to a specific kind of electronic device encompassed by the broad grouping. Obvious-to-try does not constitute obviousness. *In re Deuel*, 51 F.3d 1552, 1559 (Fed. Cir. 1995). Invitations to experiment do not establish the factual basis required for a conclusion of obviousness. *In re Piasecki*, 745 F.2d 1468, 1472 (Fed. Cir. 1984).

Watase describes an inner coating for a metal frame of an electronic device. The coating helps dissipate thermal radiation and reduces the temperature inside of the electronic device. Watase's coating is also said to possess excellent conductivity. See Watase, p. 5, ll. 1-6. The coating appears to comprise a resin having carbon black and/or other heat dissipating metal oxide fillers dispersed therein (Watase, pp. 17-21). The base resin may be a polyolefin resin, a polyester resin, a fluorocarbon resin, a silicone resin, etc. (Watase, pp. 19-20).

Watase is not at all concerned with microwave absorbability. Watase intends to improve the dissipation of thermal radiation inside the electronic device. Watase does not discuss, contemplate, or employ a magnetic powder to absorb microwaves.

Nagano discloses a coating comprising ferrite particles dispersed in a resin to prevent electromagnetic wave reflection (Nagano, col. 3, ll. 48-51). Hosoe describes resinous

coatings having dispersed therein a fine alloy powder such as permalloy for use as an electromagnetic shielding material.

There would have been no motivation to combine Watase with the teachings of Nagano, Hosoe and/or Nakao for the following reasons.

Hosoe is the closest prior art. It describes magnetic coating films seemingly for plastic electronic parts. Hosoe's coatings comprise a resin with a fine alloy powder such as "permalloy" dispersed therein. Hosoe's coatings are intended to absorb electromagnetic radiation, e.g., microwaves, and act as a shield therefrom. On the other hand, Watase's coatings comprise heat dissipating carbon black and metal oxides which are designed to reduce the elevated temperature inside an electronic device.

First, persons having ordinary skill in the art reasonably would not have considered dispersing both Watase's fillers for their intended function and Hosoe's fine alloy powder for its intended function in a single resinous coating. The purpose of Hosoe's invention is to uniformly disperse very fine Ni-Fe alloy powders in a coating for maximum absorption and shielding of electromagnetic radiation. Hosoe teaches that by uniformly dispersing magnetic metal powders having a small particle size in a coating [0008], "the gaps between the particles can be narrowed (the metal powder can be filled more densely) and, as a result, increase the shield effect." Thus, maximum absorption of electromagnetic radiation can be achieved with very thin films [0009]. Persons having ordinary skill in the art reasonably would have understood that adding Watase's heat dissipating carbon black or metal oxide fillers to Hosoe's fine magnetic alloy powder would not only undesirably reduce the density of Hosoe's fine magnetic alloy powder in a film formed from an applied coating therewith, increase the gaps between the particles, and reduce the shielding effect of the resulting film, but also undesirably increase the thickness of the film required to produce adequate absorption of electromagnetic waves. The addition of Watase's heat dissipating fillers to

Hosoe's fine alloy powder coatings would defeat the purposes of Hosoe's invention and result in both inadequate absorption of microwaves and inadequate heat dissipation. Moreover, Hosoe expresses concern that mixing metal impurities with its fine alloy powders may result in indesirable reactions therewith and a consequent reduction in desirable absorption capability [0023].

If it is the Examiner's position that it would have been obvious to apply and bond Hosoe's coatings to Watase's metal forms, Hosoe certainly does not suggest doing so and would not have enabled persons having ordinary skill in the art to do so without undue experimentation. To support a rejection for obviousness, the prior art must enable the claimed invention. *In re Hoeksema*, 399 F.2d 269, 274 (CCPA 1968). Rather, persons having ordinary skill in the art would have learned from Hosoe's disclosure that its polymeric coatings may not be suitably binding to metal frames. Nor does Hosoe contemplate applying its coatings directly to metal substrates. Because Hosoe intends to apply its coating to plastics, Hosoe does not appear to be concerned with any overheating problems and heat dissipation requirements specifically associated with metal electronic parts. Rather, Hosoe is seriously concerned that its magnetic fine alloy powders may be reduced and/or oxidized by metal, which would be especially problematic under the high temperature conditions to which Watase's metal electronic parts are seemingly exposed. In addition, Hosoe teaches that its fine alloy powders may be dispersed in thermoplastic molding resins [0041]. Thermoplastic resinous coatings, e.g., polyethylene resins, are rarely applied to protect electronic metal parts which are exposed to high temperatures.

Persons having ordinary skill in the art would have understood that Hosoe does intend to combine its coating material with a metal sheet. Thus, persons having ordinary skill in the art would not have been led to combine the teachings of Hosoe and Watase. The problems each reference faces and the solutions to the problems each faces are not related to one

another. If all prior art disclosures regarding all kinds of electrical devices were combinable based solely on their common use of electrical current, very few electrical patents would ever issue. Our patent laws were drafted to promote the useful arts, not to stymie them.

Finally, Applicant's claimed invention is directed to a resin coated metal sheet having improved electromagnetic wave absorbability and improved workability (Spec., p. 10, l. 22, to p. 11, l. 2). To accomplish Applicant's goals, the thickness of the coating film, the content of the magnetic powder in the coating film, and the kind of magnetic powder specifically recited in the pending claims was determined based on extensive experimentation. The resin coated metal sheet Applicant so determined experimentation is not reasonably suggested by the combination of prior art references applied against Applicant's claims. The outstanding rejections should be withdrawn.

For the reason stated, Applicant's pending claims are patentable over the applied prior art and otherwise in condition for allowance. Early Notice of Allowance is respectfully requested.

Respectfully submitted,

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ADHESIVES FOR POLYETHERIMIDE

ULTEM / PEI adhesion to dissimilar materials for structural bonding

What is PEI?

Polyetherimide, acronym **PEI**, is an amorphous engineering thermoplastic resin manufactured by SABIC Innovative Plastics under the trade name **Ultem** (developed by GE Plastics). **Polyetherimide (PEI)** is amber-to-transparent thermoplastic characterized by high heat resistance, high strength and modulus, excellent electrical properties that remain stable over a wide range of temperatures and frequencies, good UV and gama radiation resistance, good hydrolytic stability and excellent processibility. With similar characteristics to PEEK's, it is cheaper, although less temperature-resistant and lower in impact strength.

Ultem 2100, **Ultem 2200** and **Ultem 2300** glass reinforcement yields a product with an exceptional strength-to-weight ratio and increased tensile strength up to 24,500 psi, making **glass reinforced Ultem** one of the strongest thermoplastic materials. In addition, the glass reinforcement reduces **Ultem**'s coefficient of thermal expansion close to that of aluminum.

What are some uses of PEI?

It is frequently used in aircraft as a precertified thermoplastic, transportation, electrical appliances particularly for electrical insulation, medical tools, packaging particulalry for sensive electronics that requires low levels of ionic contaminants as in semiconductor processing, mircrowave applications due to its transparency to microwaves, structural applications requiring high strength and rigidity at elevated termperatures, and autoclaving cycles due to its excellent hydrolysis resistance. It performs continuously to 340°F (170°C), making it ideal for high strength/ high heat applications, and those requiring consistent dielectric properties over a wide frequency range.

Polyetherimide resists a wide range of chemicals including most hydrocarbons, alcohol's, and fully halogenated solvents. It resists mineral acids and tolerates short-term exposure to mild bases. Partially halogenated solvents are acceptable to **polyetherimide**.

Ultem commonly is machined into parts for reusable medical devices, analytical instrumentation, electrical/electronic insulators. **Ultem 2100, Ultem 2200 and Ultem 2300** are **glass-reinforced versions** (10, 20, and 30%, respectively) of **Ultem 1000** which provide even greater rigidity and improved dimensional stability while maintaining many of the useful characteristics of basic **Ultem**. In pharmaceutical process equipment, manifolds machined from **Ultem** plate offer resistance to hot chemical solutions and daily sanitizing--an application for which acetal has also been used.

Ultem is not designed for use in bearing and wear applications. However, to over come this limitation polyimides are somethimes fill with low friction materials such as graphite, PTFE and molybdenum disulfide. Other suitable products thermoplstics for bearing applications include flouropolymers (e.g. PTFE), nylon,

acetal, and UHMW PE. The addition of fillers to the **Ultem** could interfere with adhesion when present at the interface.

One major military naval contractor successfully employed **Ultem** for microwave transparant high strength structural components by bonding them to steel hulls using the RELTEK BONDiT B-45TH.

How do you bond PEI with an adhesive to dissimilar materials?

Care must be used in selecting adhesives and designing press fit components to avoid stress cracking. In particular watch out for notch-sensitive geometries. Also, the amorphic structure of **Ultem** can cause relaxation under influence of bondings on the long term. The BONDiT B-45TH has sufficient elasticity to absorb stresses and minimize risk of stress cracking of the **Ultem**.

Polyimides contain a large variety of chemical functions (e.g. benzene rings, ether linkages (C-O-C), carbonyl groups (C=O) and C-N functions). When the **PEI** is molded the long hydrocarbon chains align themselves so these reactive components interact to cause cross linking between the chains. This is what give **Ultem** its properties. Normally undisturbed these create a rather stable structure resistant to temperature and a wide range of chemicals, and correspondingly resistance to adhesion.

PEI can be structurally bonded to itself and to other substrates without significant preparations (light abrasion is usually recommended) using BONDiT™ brand adhesives manufactured by RELTEK. With light abrasion some of the imide molecular groups in the resin chain can be broken up to create molecular sites which are chemically active, and increase the surface energy.

BONDiT B-4x series epoxy products are designed to take advantage of these available sites to form good bonds, producing with an **Ultem**/Steel lap joint a typical lapshear strength of up to 500 PSI (pounds-per-square-inch) or 900 PSI with application of the A-43 primer. Glass filled products can produce substantially higher shear and tensile strengths with BONDiT epoxy products, even without the use of primers. Curing method can also make a difference on bonding strength.

Among the other substrates which **Ultem** can be bonded to using BONDiT™ products are: Delrin (acetal), fluoropolymers, nylon, rubber, polyethylene, polyolefin, polypropylene, polyurethane, silicone, thermoplastics, thermoset, glass and ceramics, wood, metals, stone, aggregate and concrete.

PEI is resistant to most solvents but is soluable in some chlorinated aliphatic compounds. It is also prone to stress cracking in chlorinated solvents. Hence **PEI** does not lend itself well to solvent bonding.

Besides light mechanical abrasion method of altering the surface morphology chemical etching (5% sodium hydroxide at elevated temperature), plasma treatments and ultraviolet irradiation of polymer surface, have been shown to improve adhesion of metal thin films to polyimide, measured by a peel test. Surface modification studies of polyimides indicate the formation of carbon radicals due to carbonyl oxygen losses. These radicals can either react with each other, resulting in crosslink formation among the polyimide chains on the surface and loss of adhesion sites, or with materials deposited onto the surface. It is believe that the different adhesion behaviours observed experimentally might be related to the total number of bonds formed with the radicals rather than the formation of strong bonds. BONDiT B-4x series epoxies readily form good bonds to the surface modified polyimide.

Most application, however, do not need such enhancement and work well with just the B-45TH adhesive on a lightly abraded (#100-120 grit) surface. If you think

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that your application may require this treatment, please call us at (707) 284-8808 or email us at reltek@reltekllc.com for technical support.

Other RELTEK adhesives to use with **Ultem** include B-536 & B-575 and B-755.

How do you design with Ultem for Harsh Environments?

BONDiT™ products are among the few available that as an **Ultem adhesive** will bond to itself or other substrates with differing coefficients of expansion (COE). BONDiT™ products are renowned for their resistance to harsh environments and for withstanding long term deployment without debonding. Bonding **Ultem** to dissimilar materials is a particular problem due to it's high thermal expansion coefficient--six times that of steel (unfilled PEI). As a consequence the adhesive bond joint must be designed to accommodate the expansion/contraction differential between materials to avoid bond failure. The BONDiT B-4X series epoxies are especially designed for that purpose, ranging in elongation (stretch) from 10% to 500%. Adhesive joints designed with these products have been successfully thermal cycled -50°F to+150°F, and even cryogenic temperatures (liquid nitrogen) and as high as 300°F.

Our first product recommendation for bonding **PEI** is BONDiT™ B-45TH or BONDiT™ B-482TH.

Our recommendation would change if you are overmolding or if there are other special adhesive needs.

If overmolding, we would recommend priming the substrate with our BONDiT™ A-43. An example would be molding either, thermoplastic polyurethane, two-part urethane rubber or rubbers in general such as EPDM to UHMW.

Or, if exceptional chemical resistance is desired, we would recommend the BONDiT™ B-481 or B-4811.

Abundant engineering support is provided at RELTEK for our customers

Please feel free to call or email us with your questions. Our recommendations are founded in compressive experience. We are willing to share that experience with you to ensure your success—whether or not you become a RELTEK customer, we welcome the opportunity to serve you.

Our promise

While solving the insolvable
With extraordinary customer service
We stick to you forever

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